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Title: COLORED CONTACT LENS AND METHOD OF MAKING THE SAME. ;

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ABSTRACT:

A contact lens capable of causing significant changes in the color of the iris of the eye of a wearer has a first portion contacting the eye, a second portion attached to the first portion and having an upper surface capable of being tinted, and an iris portion located between the first and second portions for masking the color of the iris. The iris portion reduces or otherwise alters the reflection color of the eye and mimics the structure of the natural iris so that the tinted color becomes the dominant color when the lens is worn.

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Colored contact lens and method of making the same.

A contact lens capable of causing significant changes in the color of the iris of the eye of a wearer has a first portion contacting the eye, a second portion attached to the first portion and having an upper surface capable of being tinted, and an iris portion located between the first and second portions for masking the color of the iris. The iris portion reduces or otherwise alters the reflection color of the eye and mimics the structure of the natural iris so that the tinted color becomes the dominant color when the lens is worn.

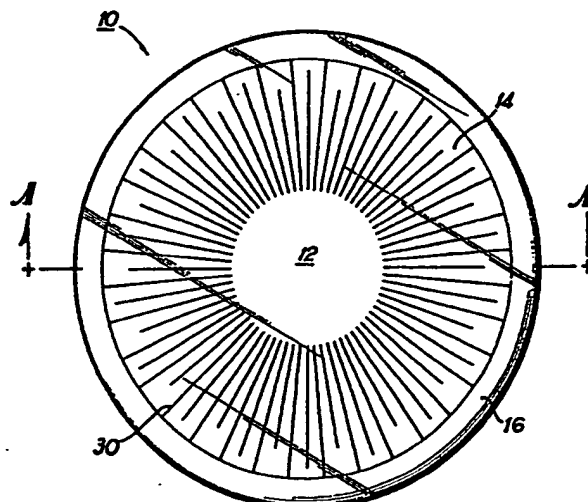


FIG 2

Colored Contact Lens and Method of Making the same.

The present invention relates to a colored contact lens according to the preamble of claim 1 and to a method for producing a contact lens according to the preamble of claim 11. More in particular, the present invention relates to coloring, shading or tinting contact lenses.

Recently, there has been a great deal of interest in contact lenses which change or otherwise alter the color of the iris of the wearer's eye. In attempts to meet this demand, various lens structures have been proposed. For example, U.S. Patent Nos. 3,557,261 and 3,679,504 to Wichterle et al. discloses a method for manufacturing contact lenses having a colored pattern enclosed between at least two layers of soft, transparent hydrogel material. U.S. Patent No. 3,536,388 to Spivack also shows an imprinted portion sandwiched between two layers of lens material for creating the appearance of alternative eye color. U.S. Patent No. 4,460,523 to Neefe discloses a method of making contact lenses which change eye color by employing small light reflecting particles imbedded in a colored transparent matrix. Canadian Patent No. 710,230 to Rich and U.S. Patent No. 4,559,059 to Su disclose lenses having tinting on their front surfaces.

Other patents relating to this area are U.S. Patent No. 4,582,402 to Knapp, and U.S. Patent Nos. 4,472,327; 4,615,593 and 4,701,038, all to Neefe.

The above examples and other known tinted contact lenses suffer from a substantial drawback. While such lenses are capable of enhancing existing eye color or changing the color of light-colored eyes, they are incapable of causing significant color changes. For example, it is difficult to change a natural dark brown eye color to pale blue using presently known lenses, because the lighter blue pigments cannot mask the darker, brown pigments. As a result, a desired color change is often impossible to achieve. Also, previous attempts at masking or changing the natural iris color have resulted in a flat, unnatural appearance of the eyes when the contact lenses are worn.

Furthermore, it is common practice for lenses to be tinted by the manufacturer and merely fitted by the local practitioner. As a result, the choice of colors available to the wearer is subject to the manufacturer's choice of product and is limited by the ability of the practitioner to maintain an inventory of a large number of lenses having an array of colors.

There exists a need, therefore, for a natural looking contact lens capable of causing significant changes in the appearance of the eye color of the

wearer, and, more particularly, changing a dark eye color to a lighter color. There also exists a need for such a contact lens which can be tinted by the local practitioner at the point of sale. There exists a further need for a method of producing such a lens which is inexpensive and efficient.

The contact lens according to the present invention and satisfying these needs and, more particularly, capable of producing significant change in the color of the eye of the wearer is described in independent claim 1. Preferred embodiments are described in dependent claims 2-10. The method of producing such a contact lens according to the invention is described in independent claim 11. Preferred embodiments are described in dependent claims 12-16.

The present contact lens has a "sandwich" construction comprising a first lens portion and a second lens portion. While it is preferred that the lens be made of a hydrophilic or "soft" contact lens material, any type of lens material may be used. The first lens portion has a rear, concave base curve. Deposited on the top surface of the first lens portion are means for masking at least partially the iris. The masking means may take any form which results in reducing or otherwise altering the original reflective color of the eye. Preferably, the masking means has a pattern formed thereon of a plurality of lines which converge toward a transparent pupillary section. The second clear lens portion includes a front curve on its upper surface and is joined along its rear surface by polymerization to the top surface of the first lens portion. It is preferable that the iris portion be composed of mica. The front curve of the second lens portion may then be colored or tinted with any desirable color by a conventional process.

This lens construction will cause a significant change in the wearer's eye color as, for example, from dark brown to pale blue, by partially masking the wearer's natural iris color so that the tinted color becomes the dominant color when the lens is worn. The sandwiched iris portion of the lens also results in a more three-dimensional, and hence a more natural, look of the tinted lens.

Furthermore, untinted lenses with their respective masked iris portions may be provided to the practitioner, who then may color the lenses as desired at the point of final sale. This allows the practitioner to sell lenses of virtually any color without having to maintain a large, expensive inventory.

More details of the invention will become clear from the following description of a preferred embodiment in connection with the drawing on which

Fig. 1 is a sectional view of a contact lens of the present invention taken along line 1-1 in Fig. 2; and

Fig. 2 is a top view of a contact lens of the present invention.

The contact lenses of the present invention are shaped like traditional contact lenses, having a concave rear surface adapted to be worn against the cornea and a convex front surface. Referring to Figs. 1 and 2, the lens 10 has a transparent optical zone or pupil portion 12, and an iris portion 14 surrounding the pupil portion 12. The iris portion 14 is a replica of the human iris. The portions 12, 14 are located on the lens 10 in such a way as to cover the underlying pupil and iris of the eye of the wearer. The diameter of the visible iris of a human usually falls between 10.5 and 13.5 mm; the pupil portion 12 typically has a diameter of approximately 4.0 to 5.0 mm. A transparent peripheral portion 16 may optionally be provided on the lens 10 in surrounding relationship to the iris portion 14.

As seen in Fig. 1, the lens 10 has a conventional "sandwich" construction comprising a first clear lens portion 18 with a rear base curve 20 and a second clear lens portion 22 having a front curve on its upper surface 26. The lens portions 18, 22 have complimentary shapes. The lens portion 18 has a top face opposite to the rear base curve 20 along which portions 18, 22 are joined together, as indicated by dotted line 24. The joining of the portions 18, 22 may be accomplished by any suitable means, including, for example, bondingly polymerizing or cementing the portions 18, 22 together.

To produce the iris portion 14, an iris masking section 28 is placed between the first portion 18 and the second portion 22. The iris masking section 28 is preferably circular in shape and is positioned in such a manner as to cover the natural iris of the eye of the wearer when the pupil portion 12 of the lens 10 is over the pupil.

It is preferable that the iris masking section 28 be soft, pliable and oxygen permeable and translucent and, most preferably, have an off-white color. For example, the masking composition may be a biocompatible ink having as its basis mica or some other opaquing material. One formulation for an opaque ink usable in the present invention comprises a mixture of approximately 13.0 grams of Green #1 dye, 1.0 grams of White #1 dye, 11.0 grams of a binder and 19.44 grams of a solvent. However, other masking compositions, including translucent materials, may be used so long as they reduce or otherwise alter the original reflection color of the eye.

The masking section 28 may be painted, sprayed or printed on the top face of the first portion 18 or on a mold surface during the lens

fabrication process. A very thin, opaque disk may also be used which is inserted between the lens portions 18, 22 prior to their being bonded together. A pattern formed from a plurality of lines 30 converging towards the pupil portion 12, as best seen in Fig. 2, may be provided on the iris masking section 28 for creating the look of a natural iris. The pupil portion 12 is in registry with the pupil of the eye of the wearer when the lens 10 is worn on the eye.

To complete the iris portion 14, the upper surface 26 of the second portion 22 is tinted. This tinting can be of any desirable color, and can be performed by a conventional surface tinting process such as set forth in U.S. Patent No. 4,559,059 to Su and incorporated herein.

It should be apparent, therefore, that the resulting lens 10 will be a multi-layered structure having the iris masking section 28 enclosed within the body of the lens 10 for obscuring the natural iris of the wearer from view and for providing an off-white or otherwise color altering backdrop to bring out the optimal colors of the upper surface 26 tinting, regardless of the color of the wearer's natural iris. The spacing between the tinted upper surface 26 and the masking section 28 creates a three-dimensional, and hence more natural, appearance to the lens 10.

The lens 10 may be manufactured in a variety of ways. One suggested method is a molded process, wherein the first portion 18 is produced in a mold. The iris masking portion 28 is stamped or otherwise placed onto the first portion 18, and lens material monomer is placed over the first portion 18. The monomer is then cured to produce the second portion 22 fused to the first portion 18 and enclosing the masking portion 28. The lens is then processed according to standard procedures. Standard lathe-cutting methods may also be used.

The lens 10 having the iris masking section 28 can then be tinted at the manufacturing facility, or can be provided to the practitioner who can tint the lens 10 as he wishes.

It can be seen that the present invention provides a lens capable of producing a significant color change to the eye of the wearer while also providing a natural looking iris.

Claims

1. A contact lens capable of changing the color of the iris of the eye of a wearer, including
 - a) a first lens portion having a rear base curve for contacting the eye and an opposite top face;
 - b) a second lens portion having an upper surface and a curved rear surface which is complementary in shape to said top face, said first and second lens

portions being joined together along said front face and said rear surface; and

c) a pattern between said first lens portion and said second lens portion,

characterized in that said upper surface is capable of being tinted and in that said pattern located between said first lens portion and said second lens portion is a means for masking at least partially said iris of the eye of the wearer and is in registry to said iris for aiding in the masking the color of said iris when said upper surface of said second lens portion is tinted.

2. The contact lens of Claim 1, wherein said iris masking means is substantially translucent.

3. The contact lens of Claim 1, wherein said iris masking means is substantially white in color.

4. The contact lens of Claim 1, wherein said iris masking means is on said top face of said first lens portion and comprises a pattern of the iris having a transparent pupil portion and a plurality of lines which conveys toward said pupil portion.

5. The contact lens of Claim 1, wherein said iris masking means is comprised of a composition containing mica.

6. The contact lens of Claim 1, wherein said iris masking means is oxygen permeable.

7. The contact lens of Claim 1, wherein said iris masking means is pliable.

8. The contact lens of Claim 1, wherein said iris masking means is made from a biocompatible material.

9. The contact lens of Claim 1, and further comprising a tinting composition on said upper surface of said second lens portion for providing the appearance of color to said iris masking means.

10. The contact lens of Claim 1, wherein said first portion and said second portion are comprised of hydrophilic material.

11. A method for producing a contact lens capable of being tinted for changing the color of the iris of the eye of a wearer, characterized by the steps of placing iris masking means between a first lens portion having a rear base curve contacting said eye and an opposite top face and a second lens portion having an upper surface and a curved rear surface and joining said curve and rear surface of said second lens portion to said top face of said first lens portion to form said contact lens, said iris masking means in registry with the iris of the eye of the wearer for changing the reflective color of the iris of the wearer.

12. The method of Claim 11, and further comprising the step of tinting the upper surface of said second lens portion.

13. The method of Claim 11, wherein said iris masking means is substantially white in color.

14. The method of Claim 11, wherein said iris

masking means is substantially translucent.

15. The method of Claim 11, wherein said iris masking means is formed on said top face.

16. The method of Claim 11, wherein said iris masking means is substantially translucent.

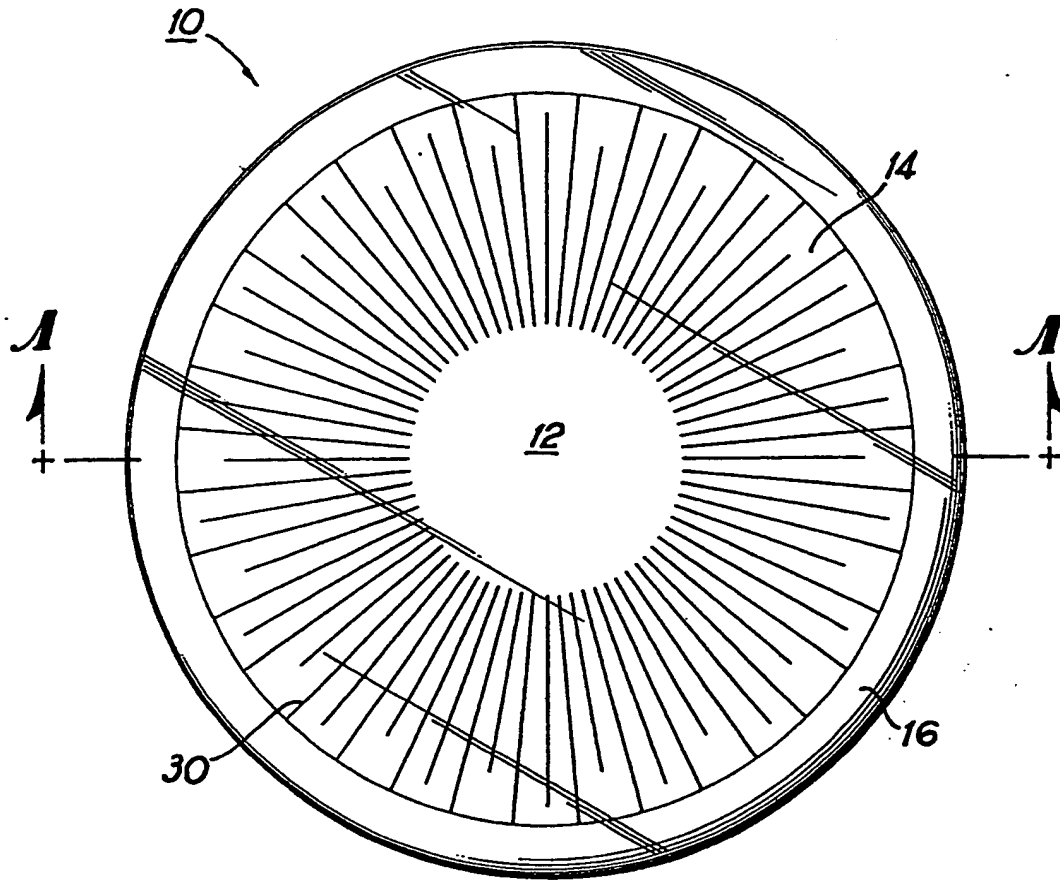


FIG 2

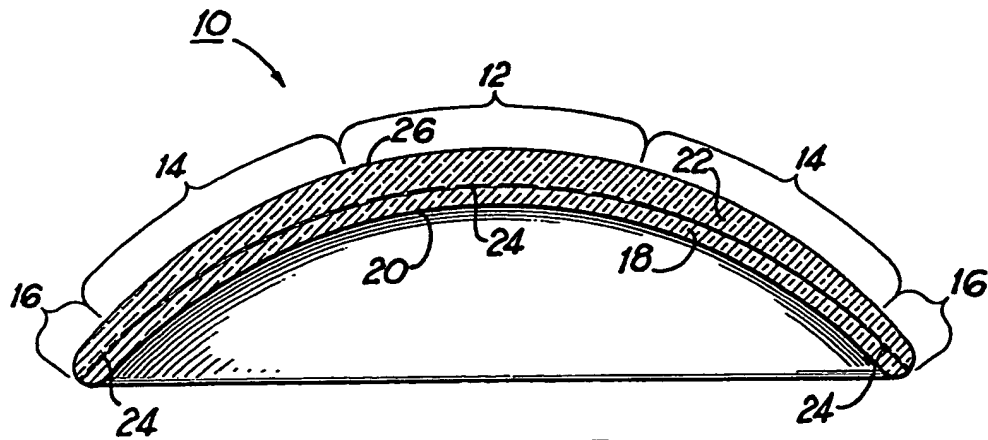


FIG 1



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 81 0842

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. CL.5) |
| D,Y | US-A-3 536 386 (M. SPIVACK) * Columns 1-2; column 4, lines 34-59 * | 1,4 | G 02 C 7/02 |
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| | | | TECHNICAL FIELDS SEARCHED (Int. CL.5) |
| | | | G 02 C 7/02 G 02 C 7/04 G 02 C 11/02 |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 07-02-1990 | Examiner CALLEWAERT-HAEZEBROUCK H |
| CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document | | | |